

# Methodological Evaluation of District Hospital Systems in South Africa

*A Multilevel Regression Analysis for Risk Reduction*

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## ABSTRACT

**Background:** District hospitals are critical nodes in the South African healthcare system, yet systematic evaluations of their operational systems for patient safety and risk reduction are methodologically underdeveloped. Existing assessments often lack the statistical rigour to account for hierarchical data structures inherent in hospital networks.

**Purpose and objectives:** This short report aims to methodologically evaluate a novel analytical framework for assessing systemic risk in district hospitals. The objective is to demonstrate the application of multilevel regression modelling to quantify risk reduction potential across different hospital system domains.

**Keywords:** *District hospitals, South Africa, Patient safety, Multilevel modelling, Risk management, Health systems evaluation, Sub-Saharan Africa*

### Article Highlights

- Multilevel modelling reveals 31% of risk variation stems from hospital-level system performance.
- Clinical process systems show strongest association with measurable risk reduction.
- Method disentangles ward-level from hospital-level effects for precise intervention targeting.
- Infrastructure scores demonstrated weaker, non-significant association with risk indices.

### Analytical Note

The study employs a two-level random intercepts model ( $y_{ij} = \beta_0 + \beta_1 X_{ij} + u_j + e_{ij}$ ) to account for the hierarchical structure of wards nested within hospitals, providing robust inference for health system evaluation.

*This report presents a methodological framework for evaluating systemic risk in district hospitals.*

## ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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